

- 1        1. A method of modulating an immune response in a mammal, comprising:  
2           identifying a mammal that has or is at risk for having a bladder disorder; and  
3           administering an isolated nucleic acid comprising an unmethylated CpG sequence  
4        to the mammal, to thereby modulate an immune response in the mammal.
- 1        2. The method of claim 1, wherein the nucleic acid is delivered to the bladder of  
2        the mammal.
- 1        3. The method of claim 2, wherein the nucleic acid is delivered to the bladder by  
2        instillation.
- 1        4. The method of claim 1, wherein the nucleic acid does not encode a naturally  
2        occurring polypeptide.
- 1        5. The method of claim 1, wherein the nucleic acid is contained within a plasmid.
- 1        6. The method of claim 1, wherein the nucleic acid is delivered by microparticles.
- 1        7. The method of claim 6, wherein the microparticle comprises a synthetic  
2        polymer.
- 1        8. The method of claim 8, wherein the microparticle comprises a synthetic  
2        polymer.
- 1        9. The method of claim 1, wherein the mammal has a bladder disorder that is  
2        characterized by inflammation.
- 1        10. The method of claim 9, wherein the inflammation is associated with  
2        symptoms of interstitial cystitis.
- 1        11. The method of claim 9, wherein the inflammation is associated with a  
2        disruption of the integrity of the bladder lining.
- 1        12. The method of claim 1, wherein a bacterial infection of the bladder of the  
2        mammal is not detected at the time of the administration of the nucleic acid.

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1           13. The method of claim 1, wherein the mammal has bladder cancer.

1           14. The method of claim 1, wherein the nucleic acid further comprises a sequence  
2       encoding  $\alpha$ -MSH.

1           15. The method of claim 1, further comprising administering a second isolated  
2       nucleic acid to the mammal, wherein the second isolated nucleic acid encodes  $\alpha$ -MSH.

1           16. The method of claim 1, wherein the mammal has a bladder disorder, and  
2       wherein administering the isolated nucleic acid results in an amelioration of one or more  
3       symptoms of the disorder.

1           17. The method of claim 16, wherein the bladder disorder is bladder cancer and  
2       wherein administering the isolated nucleic acid results in a decrease in tumor size or  
3       activity.

1           18. The method of claim 16, wherein the bladder disorder is interstitial cystitis  
2       and wherein administering the isolated nucleic acid results in a modulation of the  
3       immune response from a Th2 response to a Th1 response.

1           19. A method of modulating an immune response in a mammal, comprising:  
2       identifying a mammal that has or is at risk for having a bladder disorder; and  
3       administering an isolated nucleic acid comprising a sequence encoding  $\alpha$ -MSH to  
4       the mammal, to thereby modulate an immune response in the mammal.

1           20. The method of claim 19, wherein the nucleic acid is contained within a  
2       plasmid.

1           21. The method of claim 19, wherein the nucleic acid is contained within a  
2       microparticle.

1           22. The method of claim 21, wherein the microparticle comprises a synthetic  
2       polymer.

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1           23. The method of claim 19, wherein the nucleic acid is delivered by a  
2 microparticle.

1           24. The method of claim 23, wherein the microparticle comprises a synthetic  
2 polymer.

1           25. The method of claim 19, wherein the mammal has a bladder disorder that is  
2 characterized by an inflammation of the bladder.

1           26. The method of claim 25, wherein the inflammation is associated with  
2 symptoms of interstitial cystitis.

1           27. The method of claim 25, wherein the inflammation is associated with a  
2 disruption of the integrity of the bladder lining.

1           28. The method of claim 19, wherein a bacterial infection of the bladder of the  
2 mammal is not detected at the time of the administration of the nucleic acid.

1           29. The method of claim 19, wherein the mammal has bladder cancer.

1           30. An isolated nucleic acid comprising an unmethylated CpG sequence and a  
2 sequence encoding  $\alpha$ -MSH, wherein the unmethylated CpG sequence comprises an  
3 immunostimulatory sequence.

1           31. A method of modulating an immune response in a mammal, comprising:  
2 identifying a mammal that has or is at risk for having a bladder disorder; and  
3 administering a peptide that binds to a melanocortin receptor to the mammal, to  
4 thereby modulate an immune response in the mammal.

1           32. The method of claim 31, wherein the peptide is an  $\alpha$ -MSH peptide.

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